

CLAIMS

1. The combination of a drive pulley (30) with the rotor of a rotary electrical machine for a motor vehicle, especially an alternator or an alternator starter, comprising, firstly, a shaft (18) carrying a rotor and a front ball bearing (26), and secondly, a pulley (30) having a peripheral working zone (92) adapted to cooperate with a drive belt, together with a central hub (93) having an axial hole (94) for passage of the shaft (18) of the rotor through it, characterised in that the pulley (30) includes a splined inner portion (95) for its attachment, by force-fitting, on a complementary splined outer portion of the shaft (18) of the rotor, the latter having on its outer periphery an alternate arrangement of axial splines (76) and axial teeth (77).
2. The combination according to Claim 1, characterised in that the central hub (93) includes a transverse shoulder (96) adapted to come into abutment against a transverse face (98) of an inner race (50) of the ball bearing (26) that guides the shaft of the rotor (18) in rotation.
3. The combination according to Claim 1, characterised in that the shaft (18) includes an intermediate portion (72) which is extended in length by a smooth cylindrical surface (70) adapted to receive the ball bearing (26).
4. The combination according to Claim 3, characterised in that the smooth cylindrical surface (70) is extended in length by a splined external free end portion (75) which includes on its outer periphery an alternate arrangement of axial splines (76) and axial teeth (77).
5. The combination according to any one of Claims 1 to 4, characterised in that the splined external free end portion (75) is stepped in diameter on the outside.
6. The combination according to Claim 5, characterised in that the splined external free end portion (75) includes a short portion (78) which includes teeth (77), the outer diameter of which is equal to the outer diameter of the cylindrical surface (70).
7. The combination according to Claim 6, characterised in that the ball bearing (26) is mounted both on the smooth cylindrical surface (70) and on the short splined portion (78).
8. The combination according to Claim 1, characterised in that the free front end of the teeth (77) has a chamfer (79) for facilitating fitting of the pulley.

9. The combination according to Claim 1, characterised in that the free end of the shaft (18) includes a pilot end configuration (80) adapted to facilitate fitting of the pulley (30).
- 5 10. The combination according to Claim 9, characterised in that the pilot end configuration (80) comprises a chamfer (81) to facilitate fitting of the pulley (30).
11. The combination according to Claim 10, characterised in that the outer diameter of the pilot end configuration (80) is substantially equal to the inner diameter of a set of teeth (77') on the pulley (30).
- 10 12. The combination according to Claim 1, characterised in that the free end of the shaft (18) includes a threaded socket (82) coaxial with the axis (X-X) of the shaft (18), for the purpose of fitting the pulley.
13. The combination according to Claim 1, characterised in that the splined internal portion (95) of the pulley (30) consists of an alternate
15 arrangement of axial splines (76') and axial teeth (77').
14. The combination according to any one of the preceding Claims, characterised in that the set of teeth is conical, whereby the tooth thickness varies linearly over all or part of the length used in the force-fitting assembly operation.
- 20 15. The combination according to any one of Claims 1 to 13, characterised in that, for force-fitting the pulley (30) on the shaft (18), it is only the flanks of the teeth (77, 77') of the pulley (30) and shaft (18) that are in contact.
- 25 16. The combination according to Claim 15, characterised in that, for the force-fitting of the pulley (30) on the shaft (18), the interference is in the range between 50 and 200 microns.
17. The combination according to Claim 1, characterised in that the pulley (30) is located by an axial locating device.
- 30 18. The combination according to Claim 1, characterised in that the free end of the shaft (18) has a cutting edge over the whole perimeter of the set of teeth, while the pulley (30) has a smooth annular hub (93) for the formation of the splines of the pulley (30) by scoring during the force-fitting operation.
- 35 19. The combination according to Claim 1, characterised in that the shaft (18) and pulley (30) are formed from materials having coefficients of expansion which are close or identical to each other, whereby to guarantee the tight fit of the pulley on the shaft.

20. A method for assembly of the combination according to any one of Claims 1 to 19, characterised in that, starting with a pulley (30) having a transverse front base portion (43), an axially oriented annular extension portion (97) with a transverse shoulder (96), and a central front aperture (99),
- a threaded rod (100) is fitted by screw fastening in a threaded hole (82) in the shaft (18) of the rotor;
 - an axially oriented annular extension portion (97) of the pulley (30) is offered up to a pilot end configuration (80) of the shaft (18);
 - the pulley (30) is indexed by placing its splines (76') in facing relationship with the teeth (77) of the shaft;
 - a spacing piece (102), having an internal bore (104) and a tubular rear end portion (103), is mounted within a central front aperture (99) of the pulley, a rear face of the tubular rear end portion (103) of the spacing piece (102) coming into abutment against the transverse front base portion (43) of the pulley, while the threaded rod passes freely into the interior of the bore (104) of the spacing piece (102);
 - a nut (101) is screwed on the threaded rod (100) in contact with the front face (105) of the spacing piece (102), whereby to offer up, and firmly hold, the pulley on the pilot end configuration (80) of the free front end portion of the shaft (18);
 - the threaded rod (100) is held against movement;
 - the nut (101) continues to be screwed up towards the rear along the threaded rod (100), whereby to fit the pulley over the splined external portion (75) of the shaft (18), so as to exert a pulling force on the shaft;
 - the screwing-up operation is stopped when the transverse shoulder (96) on the pulley (30) comes into abutment against the axial front end (98) of the inner ball race (50) of the front ball bearing of the electrical machine; and
 - the threaded rod (100), carrying the spacing piece (102) and the nut (101), is withdrawn.